

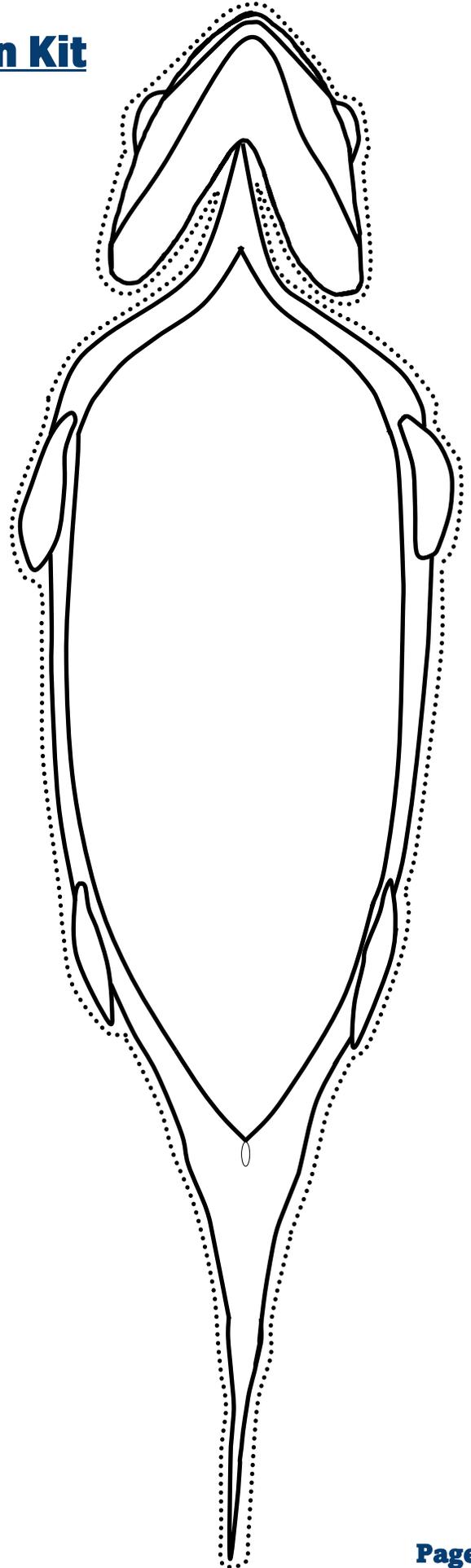
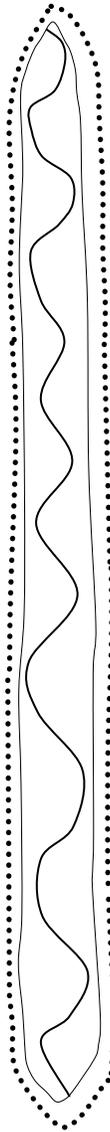
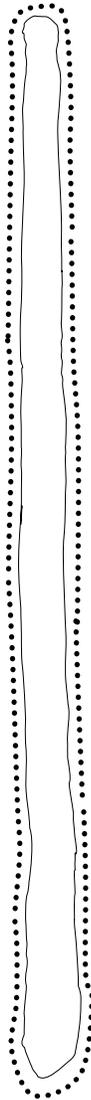
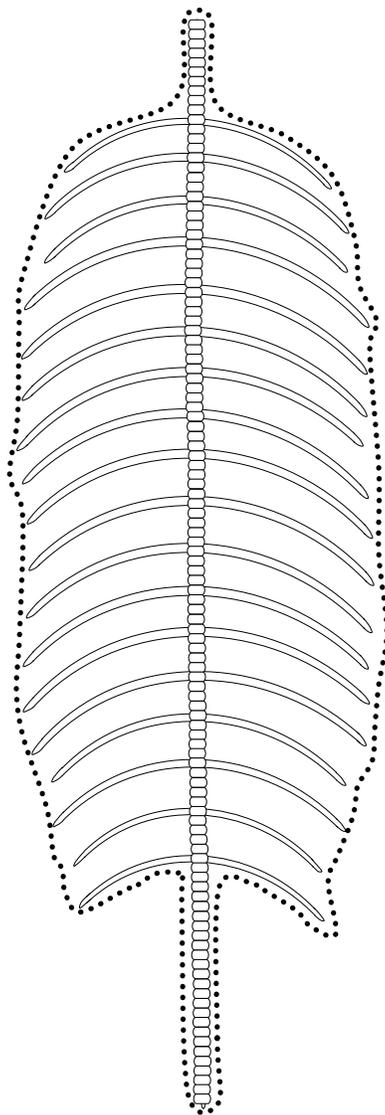
Montana Fish, Wildlife & Parks

Fish Dissection Kit

Start your dissection by coloring the different organs and body parts. See the colored diagram for help.



When finished coloring, cut out the different parts along the dotted line.

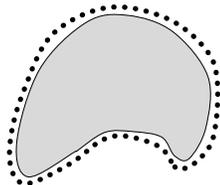
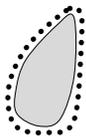
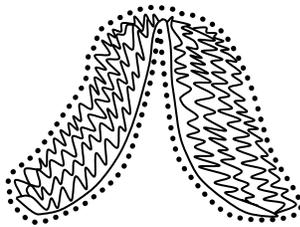
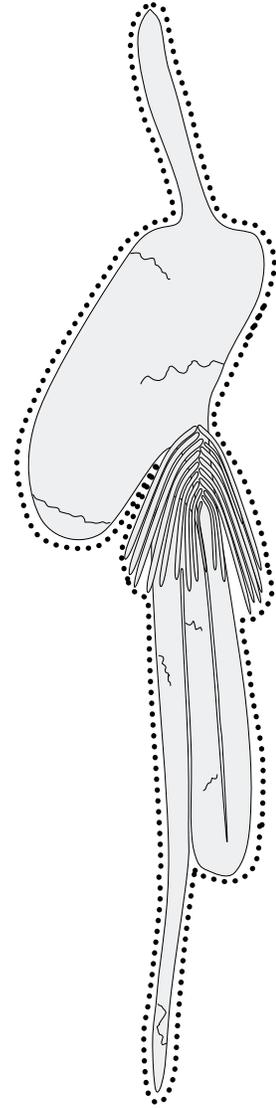
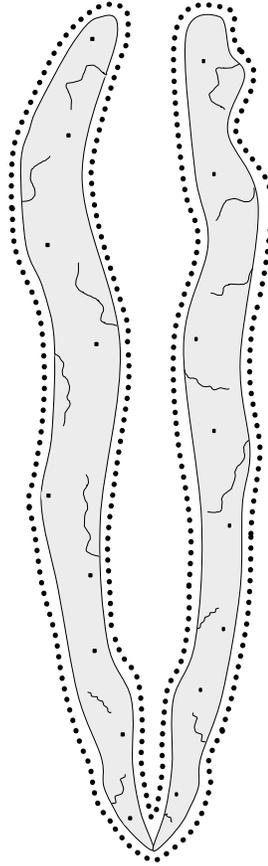
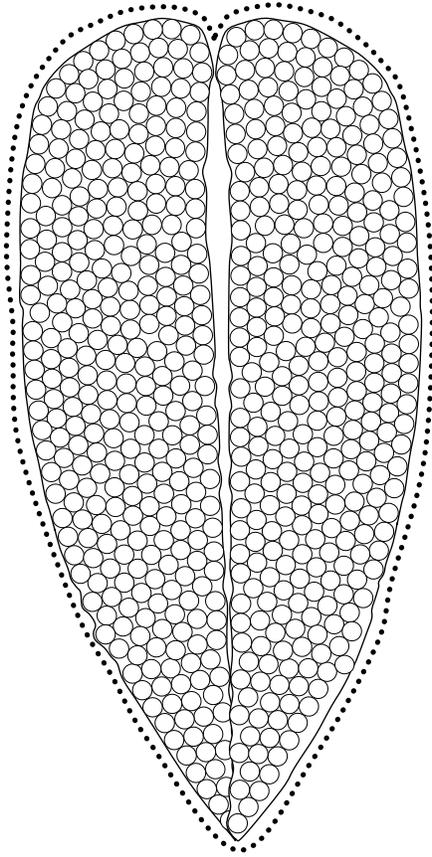


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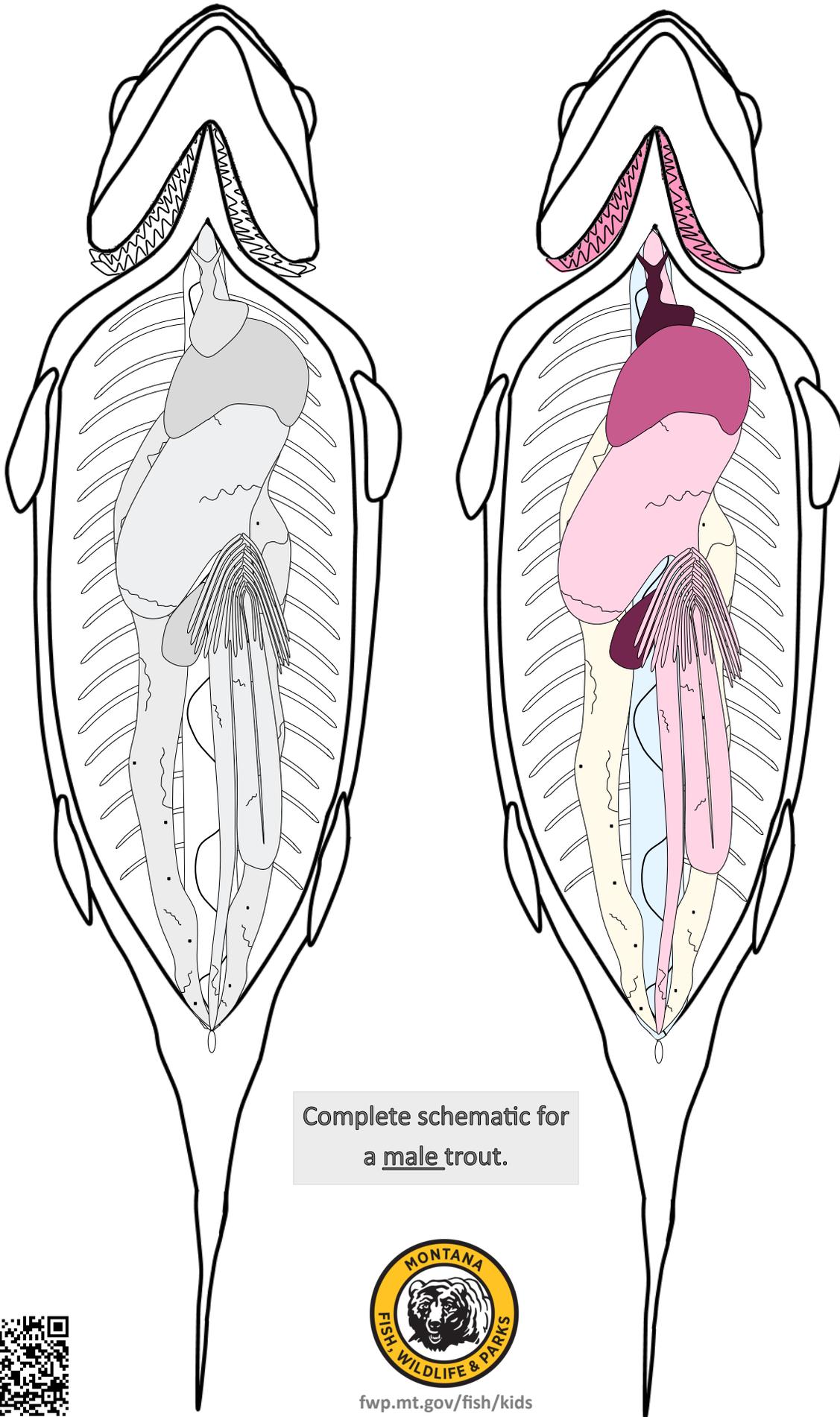
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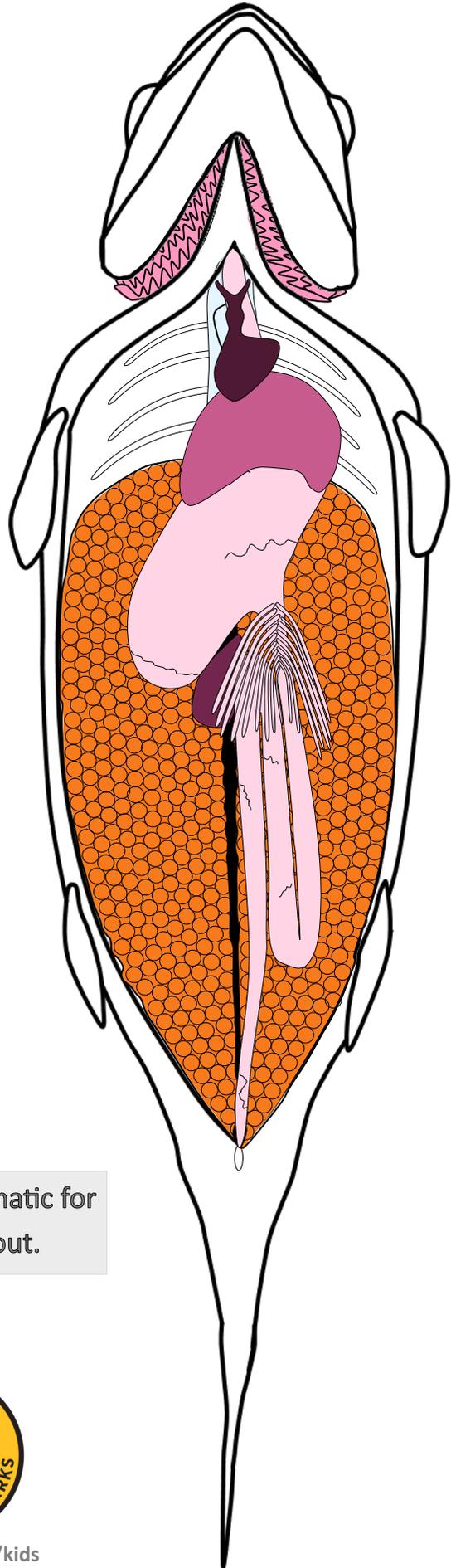
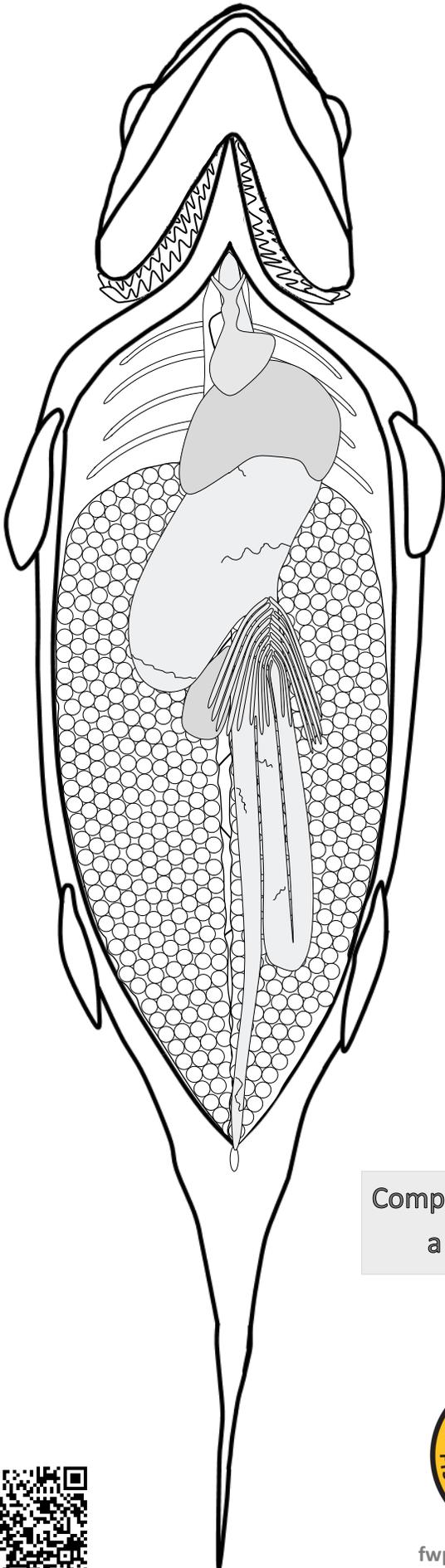
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Complete schematic for
a male trout.



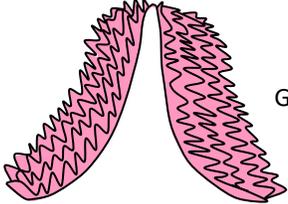
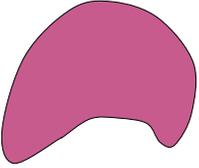
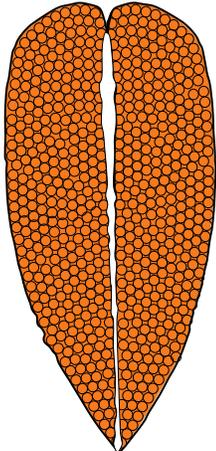
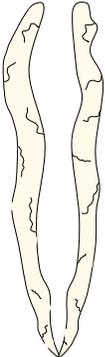
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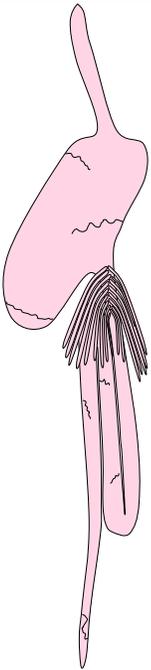
Complete schematic for a female trout.

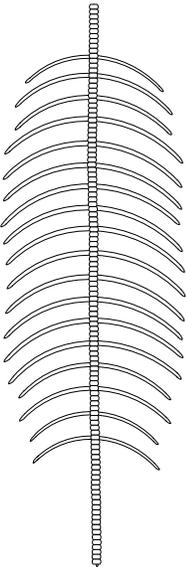


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 <p>Gills</p>	<p>The gills start the circulatory system. By gulping water through the fishes mouth, water is forced to the back of the throat to the gills. The gills which are filled with red blood cells are used to absorb the oxygen from the water and then carry the oxygen into the body. The use of red blood cells by gills makes the oxygen extraction more efficient than lungs in mammals.</p>
 <p>Spleen</p>	<p>The spleen is an organ in the digestive system. This organ provides emergency blood cells by recycling and storing worn out red blood cells from the body.</p>
 <p>Liver</p>	<p>The liver is part of the digestive system, and is the second largest organ in the body. The liver is a filter and therefore strips off contaminants within the blood cells as well as maintains metabolic functions, and storage of nutrients. The liver is used by fishery biologists to test the health of a fish as well as to test for environmental contaminants within a waterbody.</p>
 <p>Heart</p> <p>Arteries Ventricle Aorta Atrium</p>	<p>The heart of the fish has three main parts, the atrium, the ventricle aorta, and the arteries. The muscle of the heart, the atrium and ventricle aorta, pump blood into the arteries, which distributes blood throughout the body and into the gills where oxygen is pulled from water.</p>
 <p>Gall Bladder</p>	<p>The gall bladder is part of the digestive system. Found underneath the liver next to the stomach, the gall bladder is filled with green bile that is excreted to help with digesting fats from food in the stomach.</p>
 <p>Egg Sacks</p>	<p>Egg sacks are found in a female fish when they are preparing for spawning. Biologists refer females with developed eggs as being gravid. The eggs remain inside a membrane, 'sack' during development. When the female is ready to spawn, the eggs will then come loose from the sack and move freely within the body cavity. When the female expels the eggs she will release them through the vent found next to the anus. Depending on the species of fish, the number of eggs laid by a female is proportional to the body size rather than age of the female at the time of spawning. Montana does have some freshwater fish species that do not lay eggs and therefore are referred to as 'livebearers'. The livebearer species found in the state were illegally introduced as former aquarium pets, and therefore are not native to Montana.</p>
 <p>Testes</p>	<p>Gonads refer to the reproductive organs of both male and female fish. The male gonads are called testes. During the time of spawn the male testes will swell and become firm in order to produce sperm, also known as milt. Depending on the species of fish, male fish could fertilize eggs thousands of eggs from several different females, this is a form of mating called polygyny. Some fish species, such as Brook Stickleback or bass have displayed monogamist mating practices where there is one male builds a nest where a female will lay her eggs and the male will fertilize then protect the nest until the eggs hatch.</p>



 <p>Digestive System</p>	Esophagus	The digestive system is made up of the esophagus, stomach, pyloric caeca, the intestines, liver, gall bladder, spleen, and the anus. This system is the process of collecting nutrients from the food eaten by the fish and exiting the body as waste.
	Stomach	The stomach is the main storage facility for what the fish eats. In the stomach there is acid and bile that is used to break down solids into smaller parts or liquid form.
	Pyloric Caeca	The pyloric caeca absorbs the nutrients from the food as it passes into the intestines and then secretes those nutrients into the blood. This organ is similar to the small intestine that is found in humans.
	Intestine	Fish have a very small intestinal track unlike most mammals, and therefore they absorb nutrients from food quickly as it is past through the system.
	Rectum	When digested food is ready to be expelled from the body it will briefly be stored in the rectum before it pushed out through the anus. The anus is the only way to expel liquid and solid waste from the body and is separate from the vent, which is part of the reproductive system.
	Anus	

	Vertebrae and Rib Cage	<p>The vertebrae, or 'backbone' of fish is the characteristic that puts them into the 'Vertebrae' classification. Humans also have a vertebrae and therefore share that trait with fish. The difference between humans and fish however is fish vertebrae spans the length of the body verse humans. If humans had the same proportion of vertebrae as fish do we would have a tail and look similar to a kangaroo.</p> <p>The rib cage shape and size varies between species. Some species have more ribs than others. Some anglers prefer not to eat some fish because, "they are too bony" to eat. What these people are referring to are the, 'floating' spines that are found between the individual rib spaces in difference species. This is a schematic of a fish's rib cage does not reflect the 'floating spines'. This schematic also doesn't reflect the total pairs of ribs a fish can have. Some trout species have up to 30 pairs of ribs.</p>
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 <p>Kidney</p>	 <p>Air Bladder</p>	<p>In trout, the kidney has two parts joined together with a membrane. There is a front portion and a back portion. The front portion creates and produces red blood cells. The back portion cleans blood and produces urine which is expelled from the body through the anus.</p> <p>Anadromous salmon species that travel from freshwater to salt water, go through a process called osmoregulation. The kidney is very important in this process.</p> <p>The air bladder also called the 'swim bladder' is a membrane that traps air along the back-bone and kidney. Fish use the air bladder to regulate their buoyancy and their position within the water column of the lake, pond, stream or river. Unless the air bladder is damaged, the air will remain in the fish even after death.</p>
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Instructions

Start your dissection by coloring each of the organs and body parts found on page 1 and 2. Please use the table on pages 5 and 6 for color reference. After all the organs and body parts are colored, carefully cut out all the individual pieces along the dotted line.

As you place organs and different body parts into your fish, read the table to best learn as to what each part does for the body. Refer to the completed schematics for reference as to the location of each part. Understand that this dissection is building the fish from inside out. Once you have a completed fish, we recommend taking the organs back out in opposite order to mimic a dissection of a real fish. To help your layering of organs and body parts tape the nose and the caudal fin, or tail, down onto the table. We recommend using two large paperclips to hold the parts in place as you complete the dissection. Refer to QR code video for further assistance.

Locate and label the mouth and vent of a fish.

1. Start with placing the fish body in front of you.
2. Place vertebrate and ribcage into the body of the fish.
3. Place the kidney on top of the backbone.
4. Place air bladder on top of the kidney.
5. Decide which reproductive organs you wish to use for your dissection, male or female, and place it on top of the air bladder.
6. Place the digestive system, esophagus, stomach, pyloric caeca, intestine, rectum, and anus, on top of the reproductive organ.
7. Using the completed schematic for reference, place the spleen, underneath the pyloric caeca and next to the stomach.
8. Place the gall bladder on top of the stomach where the esophagus connects with the stomach.
9. Place the liver on top of the gall bladder covering the area where the esophagus connects with the stomach.
10. Place the heart on top of the liver, also covering the esophagus, note that the arteries look like they go into the 'neck' area of the fish.
11. Place the gills behind the head of the fish.

Congratulations! You have completed your dissection. We recommend that you now start at step 11 and remove each part to mimic a dissection of a real fish.

